

Claims

- [c1] A spinal fixation device, comprising:
first and second elongate members coupled to one another such that the first and second elongate members are angularly adjustable relative to one another; and
a locking mechanism adapted to lock the elongate members in a fixed position relative to one another independent of a bone anchor.
- [c2] The spinal fixation device of claim 1, wherein angular adjustment of each elongate member is limited to a single plane.
- [c3] The spinal fixation device of claim 1, wherein angular adjustment of the first elongate member is limited to a first plane and angular adjustment of the second elongate member is limited to a second plane that is parallel to the first plane.
- [c4] The spinal fixation device of claim 2, wherein the first and second elongate members are angularly adjustable along the single plane 360° relative to one another.
- [c5] The spinal fixation device of claim 1, wherein the first and second elongate members are angularly adjustable

in multiple directions relative to one another.

- [c6] The spinal fixation device of claim 5, wherein the first and second elongate members are angularly adjustable in a range about 5° to 45° in all directions from a central axis of each elongate member.
- [c7] The spinal fixation device of claim 1, wherein the first and second elongate members each comprise a spinal fixation rod.
- [c8] The spinal fixation device of claim 1, wherein the first and second elongate members each comprise a spinal fixation plate.
- [c9] The spinal fixation device of claim 1, wherein the first elongate member is a spinal fixation rod and second elongate member is a spinal fixation plate.
- [c10] The spinal fixation device of claim 1, wherein the first elongate member has a diameter that is different than a diameter of the second elongate member.
- [c11] The spinal fixation device of claim 1, further comprising a connecting feature formed on a terminal end of each of the first and second elongate members for coupling the first and second elongate members to one another, and for allowing angularly adjustability of the elongate mem-

bers.

- [c12] The spinal fixation device of claim 11, wherein the connecting feature on the first elongate member comprises a female connector, and the connecting feature on the second elongate member comprises a male connector adapted to receive the female connector.
- [c13] The spinal fixation device of claim 12, wherein the female connector includes opposed arms defining a recess therebetween for receiving the male connector.
- [c14] The spinal fixation device of claim 13, further comprising a bore extending through the opposed arms on the female connector and through the male connector, and a central mating element extending through the bore for mating the male and female connectors to one another.
- [c15] The spinal fixation device of claim 14, wherein the central mating element comprises a cylindrical member, the cylindrical member being adapted to allow at least one of the first and second elongate members to rotate thereabout.
- [c16] The spinal fixation device of claim 15, wherein the cylindrical member is fixedly coupled to a portion of the female connector, and the male connector is free to rotate about the cylindrical member.

- [c17] The spinal fixation device of claim 16, wherein the locking mechanism is effective to engage the cylindrical member to prevent movement of the male connector relative to the female connector.
- [c18] The spinal fixation device of claim 17, wherein the locking mechanism comprises a slot extending through the male connector such that the male connector is in the form of a clamp, and wherein the locking mechanism further comprises a fastening element adapted to engage the male connector to clamp the cylindrical member within the bore.
- [c19] The spinal fixation device of claim 18, wherein the fastening element comprises a threaded member.
- [c20] The spinal fixation device of claim 11, wherein the connecting feature on each of the first and second elongate members rotate about a central axis extending substantially perpendicular to an axis of each first and second elongate members.
- [c21] The spinal fixation device of claim 11, wherein each connecting feature includes opposed inner and outer surfaces, and wherein the inner surface on each connecting feature is in contact one another.

- [c22] The spinal fixation device of claim 21, wherein the inner surface on each connecting feature is adapted to prevent rotation of the first and second elongate members relative to one another when the locking mechanism is in a locked configuration.
- [c23] The spinal fixation device of claim 22, further comprising anti-rotation features formed on the inner surface of each connecting feature.
- [c24] The spinal fixation device of claim 23, wherein the anti-rotation features comprise gear teeth formed on the inner surface of each connecting feature.
- [c25] The spinal fixation device of claim 23, wherein the anti-rotation feature is adapted to allow each connecting feature to rotate in increments relative to one another.
- [c26] The spinal fixation device of claim 25, wherein each increment allows angular rotation in the range of about 1° and 10°.
- [c27] The spinal fixation device of claim 22, further comprising a first bore extending through the inner and outer surface of the connecting feature on the first elongate member and a second bore extending through the inner and outer surface of the connecting feature on the second elongate member, the first and second bores being

adapted to receiving the locking mechanism.

[c28] The spinal fixation device of claim 27, wherein the locking mechanism comprises a fastening element having a head and a shaft with threads formed thereon, and wherein the first bore is configured for freely rotatably receiving a portion of the shaft of the fastening element, and the second bore is threaded for mating with the threads formed on the shaft of the locking mechanism.

[c29] The spinal fixation device of claim 22, further comprising a central bore extending through the inner and outer surface of each connecting feature on the first and second elongate members and a pin member disposed through the central bore.

[c30] The spinal fixation device of claim 29, wherein the pin member includes a transverse bore extending therethrough for receiving at least a portion of the locking mechanism.

[c31] The spinal fixation device of claim 30, wherein the locking mechanism extends through a receiving bore formed in at least one connecting feature and the transverse bore in the pin member.

[c32] The spinal fixation device of claim 31, wherein the receiving bore is threaded for mating with corresponding

threads formed on the locking mechanism.

- [c33] The spinal fixation device of claim 31, wherein the locking mechanism comprises a set screw.
- [c34] The spinal fixation device of claim 31, wherein the locking mechanism is adapted to engage the pin member to translate the first and second connecting features toward one another to lock the first and second elongate members in a fixed position relative to one another.
- [c35] The spinal fixation device of claim 34, wherein at least one of the transverse bore in the pin and the bore in the at least one connecting feature includes a chamfered portion such that when the locking mechanism is advanced therethrough the locking mechanism translates the first and second connecting features toward one another.
- [c36] The spinal fixation device of claim 34, wherein the transverse bore in the pin member is axially offset from the bore in the at least one connecting feature such that when the locking mechanism is in an unlocked position it is effective to allow the first and second connectors to freely rotate relative to one another.
- [c37] The spinal fixation device of claim 30, wherein a proximal portion of the locking mechanism is threaded and a

distal portion of the locking mechanism is non-threaded such that when the locking mechanism is in an unlocked position the non-threaded portion extends into the transverse bore of the pin member.

- [c38] The spinal fixation device of claim 1, wherein the first and second elongate members are slidably coupled to one another.
- [c39] The spinal fixation device of claim 38, wherein the connecting feature on each of the first and second elongate members comprises a substantially curved terminal portion, the terminal portions being complementary for slidably mating to one another.
- [c40] The spinal fixation device of claim 39, wherein each terminal portion includes an opening formed therein for receiving the locking mechanism.
- [c41] The spinal fixation device of claim 39, further comprising anti-sliding surface features formed on the terminal portion of each of the first and second elongate members to prevent movement of the first and second elongate members relative to one another when the locking mechanism is in a locked configuration.
- [c42] A spinal fixation device, comprising:
first and second elongate members, each having a con-

necting feature formed on a terminal end thereof, the connecting features being coupled to one another such that the first and second elongate members are angularly adjustable relative to one another;
a locking mechanism adapted to extend into at least one of the connecting features to lock the first and second elongate members in a fixed position relative to one another.

- [c43] A spinal fixation device, comprising:
first and second elongate members coupled to one another such that the first and second elongate members are angularly adjustable relative to one another, the angular adjustability of each elongate member being limited to a single plane;
a locking mechanism adapted to lock the elongate members in a fixed position relative to one another.
- [c44] The spinal fixation device of claim 43, wherein the locking mechanism extends along an axis that is substantially parallel to the single plane of angular adjustability of each elongate member.
- [c45] The spinal fixation device of claim 43, wherein the locking mechanism extends along an axis that is substantially perpendicular to the single plane of angular adjustability of each elongate member.

- [c46] A spinal fixation device, comprising:
a first elongate element having a clamping mechanism formed on a terminal end thereof;
a second elongate member having a terminal end adapted to be received by the clamping mechanism on the first elongate element; and
a locking mechanism adapted to lock the clamping mechanism such that the second elongate member can be maintained in a fixed position relative to the first elongate member.
- [c47] The spinal fixation device of claim 46, wherein the first elongate element has a diameter different from a diameter of the second elongate element.
- [c48] The spinal fixation device of claim 46, wherein the first elongate element has a diameter that is the same as a diameter of the second elongate element.
- [c49] The spinal fixation device of claim 46, wherein the terminal end of the second elongate element is positioned at an angle relative to a longitudinal axis of the second elongate element.
- [c50] The spinal fixation device of claim 49, wherein the angle is about 90°.

- [c51] A spinal fixation device, comprising:
first and second elongate members, each having a protrusion formed on a terminal end thereof; and
a locking mechanism adapted to opposably receive the protrusion of each elongate member such that the first and second elongate members are angularly adjustable relative to the locking mechanism, and to lock the elongate members in a fixed position relative to one another.
- [c52] The spinal fixation device of claim 51, wherein the first and second elongate members each comprise a spinal fixation rod.
- [c53] The spinal fixation device of claim 51, wherein angular movement of each elongate member relative to the locking mechanism is in the range of about 30° to 60° in all directions.
- [c54] The spinal fixation device of claim 51, wherein the first and second elongate members can form an angle in the range of about 0° to 120° relative to one another.
- [c55] The spinal fixation device of claim 51, wherein each protrusion is a bulbous protrusion.
- [c56] The spinal fixation device of claim 51, wherein the locking mechanism includes a central opening formed therein and extending from opposed top and bottom

surface thereof, and opposed side openings formed therein, the protrusion on each of the first and second elongate members being positioned within the central opening and the opposed side openings being adapted to prevent passage of the protrusions therethrough.

[c57] The spinal fixation device of claim 56, wherein the locking mechanism includes a fastening element disposed through the central opening, and a receiving element disposed within the central opening for mating with a portion of the fastening element.

[c58] The spinal fixation device of claim 57, wherein the fastening element includes threads formed thereof for mating with corresponding threads formed within the receiving element.

[c59] The spinal fixation device of claim 57, wherein the fastening element is adapted to be partially engaged with the receiving element to allow the first and second elongate member to rotate freely relative to the locking mechanism, and wherein the fastening element is adapted to be fully engaged with the receiving element to lock the first and second elongate members in a fixed position.